



Software Management Environment (SME) Release 9.4

User Reference Material

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**SOFTWARE MANAGEMENT ENVIRONMENT (SME)
RELEASE 9.4**

USER REFERENCE MATERIAL

September 1992

FLIGHT DYNAMICS DIVISION

CODE 550

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PREFACE

Because of the evolutionary nature of the Software Management Environment (SME) prototype, this document is being issued in draft form to serve as a working reference for conveying up-to-date user information. The material will be updated, as necessary, for new releases of the software and will be issued in the future as a formal user's guide.

Questions concerning this document or proposed changes shall be addressed to

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ABSTRACT

This document contains user reference material for the Software Management Environment (SME) prototype, developed for the Systems Development Branch (Code 552) of the Flight Dynamics Division (FDD) of Goddard Space Flight Center (GSFC). The SME provides an integrated set of management tools that can be used by software development managers in their day-to-day management and planning activities. This document provides an overview of the SME, a description of all functions, and detailed instructions concerning the software's installation and use.



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SECTION 1 - INTRODUCTION

This document presents user reference material for Release 9.4 of the Software Management Environment (SME). The SME is being developed for the Systems Engineering Branch (Code 552) of the Flight Dynamics Division of Goddard Space Flight Center (GSFC). The SME's purpose is to provide an integrated set of management tools that can assist software development managers in their day-to-day management and planning activities.

The SME software resides on the Systems Technology Laboratory (STL) disk STL_DISK1 in directory SME, and is available on the STL VAX 11/780 and 8820 computers. A valid STL VAX account, an IBM personal computer (PC) or compatible PC with an enhanced graphics adapter (EGA) color monitor, support for serial asynchronous communications, and a copy of the SME PC communications program are required to run the SME.

The information in this document is organized as follows: the remainder of this section presents a brief overview of the SME. Section 2 contains step-by-step instructions for installing the SME communications program on a PC workstation and accessing the VAX-resident portion of the software. Section 3 provides information regarding the use of menus, selection lists, display lists, and data entry screens that appear throughout the system. Section 4 presents general instructions for entering the SME and provides a description of the SME executive level functions. Sections 5, 6, 7, and 8 present detailed descriptions of the SME growth monitor, rate monitor, planning, and overall assessment functions,

respectively. Section 9 presents a detailed description of the SME display options.

1.1 FUNCTIONAL OVERVIEW

The SME provides a set of tools that can help software development managers in their typical management and planning activities. The SME consists of an executive structure and these major functions: growth monitor, rate monitor, overall assessment, and planning. Additionally, each function contains several subfunctions which will be described in later sections of this document. These functions use as input data obtained from the Software Engineering Laboratory (SEL) to provide the user with plots of a single project's performance over a period of time.

1.1.1 GROWTH MONITOR OVERVIEW

The growth monitor allows software development managers to view and analyze a project's performance. The growth monitor obtains input from data files (schedules, estimates, performance, and profile data for measures) and provides the user with plots of a single project's data for a given measure as a function of time. Guidelines derived from models of the software development process are displayed on the growth monitor plot and can be used to observe deviations from expected project performance.

The growth comparison function permits data for a given measure from one or more different projects to be scaled and displayed on the same plot. This feature permits the user to

readily compare a project's performance with other similar projects.

The predict function allows the user to predict the growth of individual performance measures.

The profile function allows the user to examine a particular growth measure in greater detail by breaking down the measure into specific distributions, or components. Guidelines are displayed that enable the user to observe deviations from expected project performance.

The assess function allows the user to view possible or known explanations for a project's deviation from an expected range.

The estimate function of the growth monitor allows the user to display (either graphically or in tabular form) a history of the manager's estimates for a given measure.

1.1.2 RATE MONITOR OVERVIEW

The rate monitor enables managers to view and analyze the ratio of any two individual performance measures that are available for a given project. The rate monitor obtains input from data files and plots the cumulative ratio of the measures as a function of time. Guidelines for this ratio may be derived from the two individual measures and displayed on the plot to observe deviations from the project's expected performance.

When the SME is run in the expert mode (allowing access to the expert system capabilities of the LISP interpreter), the rate monitor assess option provides a general analysis of project trends. Specific project measure ratios are examined and a list of possible explanations for deviations from expected values is displayed. A corresponding certainty value is presented for each explanation.

The rate comparison function permits ratios of two measures for one or more different projects to be scaled and displayed on the same plot. As with the growth comparison function, this feature enables the user to compare a project's performance with other similar projects.

The estimate function of the rate monitor allows the user to display (either graphically or in tabular form) a history of ratios of the manager's estimates for a given measure.

1.1.3 PLANNING FUNCTION OVERVIEW

The planning function enables managers to change schedules and estimate values for project measures interactively. Since a project plan consists of a schedule and a set of estimates, this function allows the user to create and use alternative plans. The planning function is also useful for creating "what if" scenarios.

1.1.4 OVERALL ASSESSMENT OVERVIEW

The overall assessment feature enables managers to view and analyze an assessment of general project qualities such as maintainability and correctability. The function interprets

current project data and reaches conclusions about the overall product and project quality.

The overall assessment examine function permits the user to further investigate the strengths and weaknesses of a project by displaying the underlying factors associated with a given attribute.

1.1.5 MENU HIERARCHY OVERVIEW

The functions described above are grouped logically into a series of menus to provide a basis for user interaction with the SME. These menus are organized into a hierarchy that reflects the functional architecture of the system. The SME executive menu enables the user to invoke the growth monitor, rate monitor, overall assessment, and planning functions. The growth monitor menu enables the user to invoke the comparison, predict, profile, assess, and estimate functions of the growth monitor. Similarly, the rate monitor menu provides access to the comparison, assess, and estimate functions of the rate monitor. Figure 1-1 depicts this menu hierarchy.

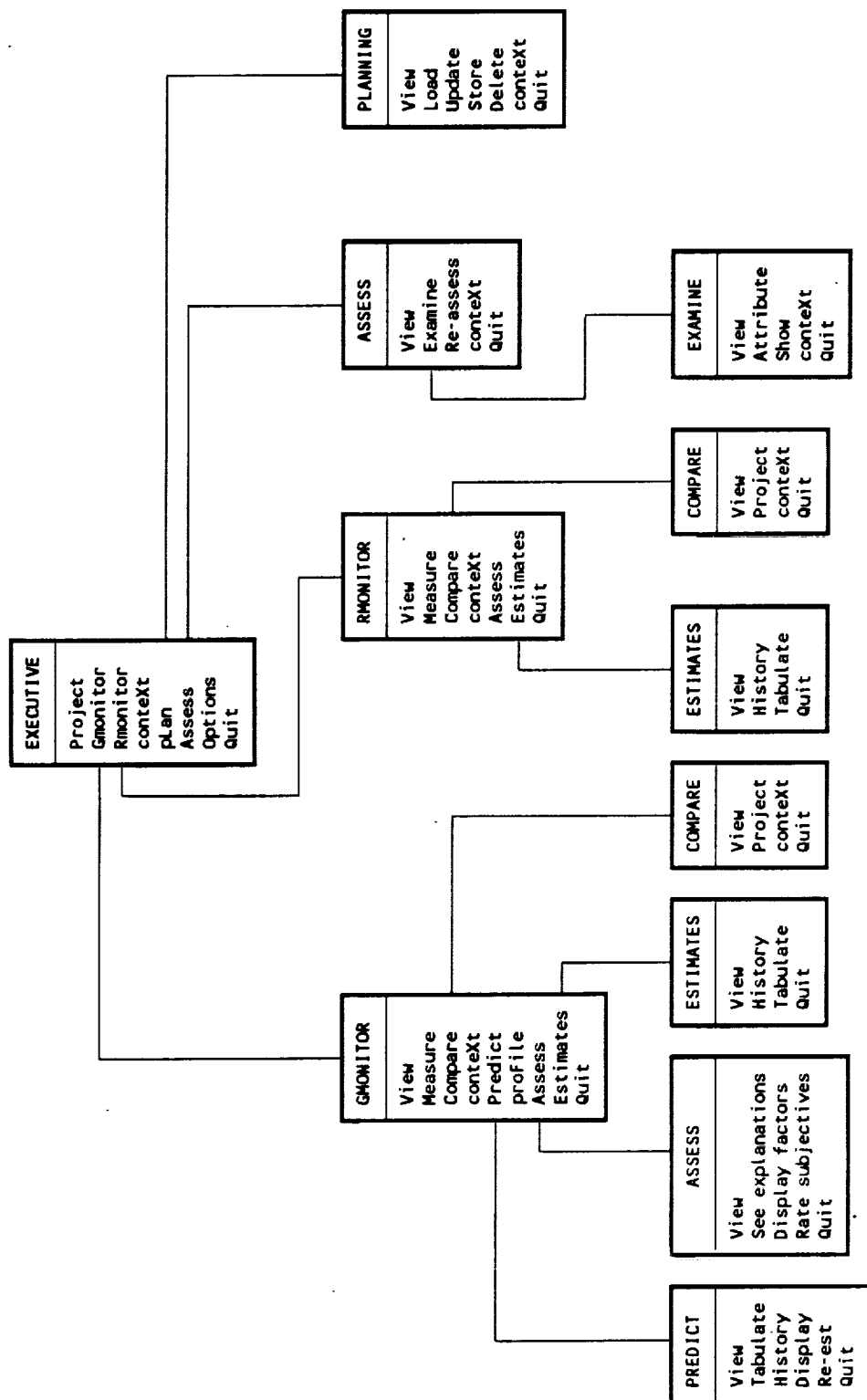


Figure 1-1. SME Menu Hierarchy

1.2 THE SME CONTEXT

Information describing a single project (termed "the project of interest") is maintained in memory during an SME session. This context holds user-specific information such as the current project name, plan name, and performance measure type. At the start of a session with the SME, the user's most recent context is retrieved from a file in which the context information from the previous SME session was saved.

A summary of the current context can be viewed by selecting "context" from most menus. When a different project is selected by the user to be the project of interest, the context is updated with data for the new project. At the end of a session with the SME, selected information from the user's context (e.g., project name, measure type) is stored in a file for subsequent retrieval at the start of the next session.

1.3 SME DATA

There are five classes of data that need to be clearly understood by users of the SME. These classes are

- Performance data
- Profile data
- Plans
- Models
- Phase estimates

Each class of data is briefly described in the following sections.

1.3.1 PERFORMANCE DATA

Performance data is the time-history record of the growth of an SME-defined performance measure. The data begins at zero at the start of a project, and the cumulative value to date is recorded at the sampling frequency. The data stops at the end of a project for completed projects and at the most recent sampling date for ongoing projects. Since the SEL collects project data on a weekly basis, the SME uses a weekly sampling frequency.

Eight measures of project performance are defined for use in the SME. These performance measures are always identified and referenced in the current release of the SME by the three-character measure codes shown in Table 1-1.

Table 1-1. Performance Measure Codes

Performance Measure	Measure Code
Effort	EFF
Module count	MOD
Lines of code	LOC
Reported changes	RCH
Reported errors	RER
Module changes	MCH
Computer usage	CPU
Computer runs	RUN

Performance data for each of the SME measures is obtained on a project-by-project basis from information in the SEL data base. The performance data for a project map to the eight SME measures as follows:

1. EFF--Effort represents total staff hours expended by programmers and line management. The hours are obtained by summing all hours, regardless of activity, reported on SEL Personnel Resource Forms (PRFs) for a week. This definition excludes service hours and project management hours.
2. MOD--Module count is the number of members in the project's controlled source code library. The count is based on information reported on SEL Services/Products Forms (SPFs). This definition makes the value dependent on the composition of the controlled library. (Note: the module count is not derived from a count of SEL Component Origination Forms (COFs).)
3. LOC--Lines of code is the number of records in the project's controlled source code library. The count is based on information reported on SEL SPFs. As with the MOD measure, this value depends on the composition of the controlled library.
4. RCH--Reported changes reflects the number of logical changes to the system. This count is obtained by summing the number of SEL Change Report Forms (CRFs) submitted for a week.
5. RER--Reported errors reflects the number of logical changes to the system that are due to an error. This count is based on the number of SEL

CRFs submitted for a week on which the type of change is listed as error correction.

6. MCH--Module changes is the number of versions of modules in the project's controlled source code library, minus the number of base versions. This count is based on information reported on SEL SPFs. (Note: this value is not derived from the count of modules changed as reported on SEL CRFs.)
7. CPU--Computer usage is the central processing unit (CPU) time used in hours by the project. These hours are based on information reported on SEL SPFs. The values from all computers used by a project are included in the total.
8. RUN--Computer runs is the number of jobs submitted by the project. This count is based on information reported on SEL SPFs. The job submission counts from all computers used by a project are included in the total.

1.3.2 PROFILE DATA

A sub-category of performance data is profile data, currently collected in conjunction with reported changes (RCH) and reported errors (RER). Collected on a weekly basis, this information provides a distribution of effort expended as provided on SEL CRFs by project developers.

Four profile types are defined for use in the current release of the SME, and are always identified and referenced by the four-character profile codes shown in Table 1-2.

Table 1-2. Profile Measure Codes

Profile Measure	Profile Code
Effort to Isolate Change	RCH1
Effort to Implement Change	RCH2
Effort to Isolate Error	RER1
Effort to Correct Error	RER2

The effort to isolate the change or error and the effort to implement the change or correction is categorized as requiring 1 hour or less, 1 hour to 1 day, 1 day to 3 days, more than 3 days, or unknown. The project-wide counts for each of these groupings are the basis for the information provided by the growth monitor "profile" option and the overall assessment function.

1.3.3 PLANS

In the SME, plans are composed of two elements: schedules and at-completion estimates.

The schedule used by the SME is derived from the set of phase dates supplied by the manager to the SEL on Project Estimates Forms (PEFs). The portion of the project life cycle used by the SME is limited to the period from the start of design through the end of acceptance testing.

The at-completion estimates used by the SME are based on the values supplied by the manager to the SEL on PEFs. The PEF-estimated values for delivered components, lines of delivered code, and effort are used to derive an estimate for each defined SME performance measure at project completion.

1.3.4 MODELS

Models of the software development process are derived from historical performance data and schedules from previous projects in the flight dynamics environment. Available models are based on either typical IBM FORTRAN attitude ground support systems (AGSSs) or Digital Equipment Corporation (DEC) Ada simulators, the two classes of systems regularly developed in the FDD environment. There is a data model for the expected cumulative growth of each defined measure.

1.3.5 PHASE ESTIMATES

Phase estimates (not to be confused with at-completion estimates) are created interactively by the manager during an SME session and recorded in an internal SME file for future reference. These estimates reflect the manager's estimate of the fraction of the project life cycle that has been completed on a specific date. The estimates are used in the prediction function of the growth monitor.

SECTION 2 - INSTALLING AND ACCESSING THE SME

This section presents detailed instructions for installing the SME communications program on a PC workstation and accessing the VAX-resident portion of the SME software. The following hardware and software items are required before the SME can be installed and used:

- IBM PC or compatible with an EGA color monitor
- Copy of the SME PC communications program
- VAX computer with the VAX portion of the SME software installed
- Modem or hard-wired connection to the VAX computer
- Valid VAX SME user identifier (e.g., SME_xxx) and password for logging on the STL computer

2.1 INSTALLING THE SME ON A PC

Insert the SME installation diskette into one of the PC disk drives. Change the default drive to reference the drive containing the diskette. For example, if the diskette is in the B drive, enter the following at the disk operating system (DOS) prompt:

C:\> B:

Before proceeding, the user must know two facts about the particular PC on which the SME is being installed:

1. The number of the PC communications port attached to the VAX communications line (normally 1 or 2)
2. The baud rate of the communications line to the VAX (e.g., 4800, 9600)

The definitive source for this information is the PC system coordinator for the user's organization. The SME PORTSTAT utility, included on the installation diskette, may be used to assist in determining the appropriate number to reference the PC communications port. To run this utility, enter

B:\> portstat

For each PC communications port found, the utility outputs one of the two following messages:

comX: status is HHHH

comX: is not present

In these messages, X will be the port's number (i.e., 1 or 2) and HHHH will be the port's status displayed in hexadecimal.

If one communications port is reported as not present, the user may assume the other port is attached to the VAX

communications line. Some PCs, however, have multiple communications ports, and a status code will be reported for each port. In this case, the user should consult the PC system coordinator to determine the proper port to reference.

Once the port number and baud rate for the VAX communications line are determined, the installation can be completed by entering

```
B:\> install
```

The INSTALL program executed by the command will prompt the user for the port number and baud rate before installing the needed SME PC software in the directory C:\SME on the hard disk. If the SME directory does not exist, the program will create it; if the directory already exists, any previously installed versions of the SME communications software will be overwritten.

As previously stated, executing the SME requires a VAX computer with a copy of the VAX-resident portion of the SME software. Detailed procedures governing the installation of the SME VAX software can be found in the SME installation guide (Reference 1).

2.2 ACCESSING THE SME FROM A PC

The method for accessing the SME from a PC consists of the seven steps delineated as follows.

Step 1 - Establish a connection between the PC and the VAX

This activity varies depending on the hardware configuration used by the PC to communicate with the VAX. If the PC is hardwired to the VAX, this step may be ignored. For most remote PCs connected by telephone, this step consists of setting the baud rate for the telephone's data line and dialing the appropriate number for the VAX.

Step 2 - Start the SME communications program on the PC

Set the default directory on the PC to the SME directory and start the SME communications program by entering

```
C:\> cd \SME  
C:\SME> smestart
```

A listing of the communications parameters in use will be displayed followed by the message "Press return to connect". In response, press the <Enter> key.

Step 3 - Log on to the VAX

As with Step 1, this activity varies based on the hardware configuration used by the PC to communicate with the VAX.

Proceed through the various levels of communications hardware and network messages, if any, until the VAX logon prompt is displayed. At this point, enter the necessary VAX SME user identifier and password as in the following example:

Username: `SME_xxx`

Password: `[REDACTED]`

Step 4 - Set up to run the SME on the VAX

After successfully logging on to the VAX, enter the following command to go to the directory in which the SME software resides:

`$ set def [sme]`

Step 5 - Start the SME program on the VAX

Execute the SME by entering

`$ @sme`

There is an optional parameter, "expert", that can be entered when issuing the above command. Because the SME requires a LISP environment to enable the expert system feature (Section 6.6), this parameter assumes LISP is available on the VAX on which the SME is to be run. To run in this environment, enter the following:

`$ @sme expert`

After one of the above commands has been issued, the PC's screen will clear and the SME program will start. (Refer to Section 4 for the procedure to follow to enter the current release of the SME. See Section 2.3 for directions on temporarily returning to the DOS environment to execute commands on the PC.)

Step 6 - Log off from the STL VAX

After terminating the SME program, log off from the VAX by entering

\$ logoff

Subsequently, terminate the communications connection and, if needed, hang up the data line on the telephone.

Step 7 - Terminate the SME communications program on the PC

Terminate the SME communications program and return to the DOS environment on the PC by pressing the <Alt-X> key (i.e., hold down the Alt key and press the X key).

2.3 TEMPORARILY RETURNING TO DOS

A simple series of steps can be used to move back and forth between the VAX session and DOS after running the SME on the VAX computer.

To switch from the VAX session to the PC, follow these steps:

- If the SME software is running on the VAX, terminate the SME by selecting "Quit" at the executive menu (see Section 3.2).
- Return to DOS by pressing the <Alt-X> key (see Step 7 above).

At this point, the PC screen shows the DOS prompt. The user may perform local PC tasks under DOS while the VAX session is temporarily suspended.

To resume the VAX session, follow these steps:

- If necessary, return to the SME directory on the PC.
- Restart the SME PC communications program by entering "smestart" (see Step 2 above).

At this point, the user can obtain the VAX prompt by pressing the <Enter> key and may execute any VAX command or restart the SME (see Step 5 above).

2.4 RECOVERING FROM AN ABNORMAL TERMINATION

If the SME should somehow terminate abnormally, the user can return to the VAX "\$" prompt by pressing the <Alt-X> key and then pressing the <Cntl-Y> key. At this point the user may execute any VAX command or restart the SME (see Step 4 above).



SECTION 3 - USING MENUS, LISTS, AND WINDOWS

The SME employs a variety of basic, system-wide display mechanisms for interacting with the user in a consistent manner. The primary mechanisms can be categorized as selection menus, selection lists, display lists, and data entry windows.

3.1 SELECTION MENUS

Selection menus are used to choose from options that control the execution of SME functions. Options grouped on a given menu correspond to a set of related features available at a specific level within the functional hierarchy of the system. Examples of selection menus in the SME include the executive menu, the growth monitor menu, the rate monitor menu, and the predict menu.

The options available on any SME menu are displayed in a horizontal bar on the top row of the screen with one of the options highlighted. A message that briefly explains the function of the highlighted option appears on the following row.

Pressing the <Enter> key selects the currently highlighted option and initiates the execution of the corresponding SME function. Pressing the <Esc> key returns to the next highest menu in the hierarchy.

Cursor control keys may be used to move the highlighting from the current option to another desired option in the menu as follows:

- The left arrow key moves the highlight to the left by one option, wrapping around to the last option as needed.
- The right arrow key moves the highlight to the right by one option, wrapping around to the first option as needed.
- The <Home> key moves the highlight to the first option in the menu.
- The <End> key moves the highlight to the last option in the menu.

An alternative method for selecting menu options involves the use of hot keys. One character of each option in the menu is capitalized and displayed in a different color. This letter serves as the hot key for the option. Since this hot key should uniquely identify its option, the key will not always be the first character of the option. Pressing a hot key character automatically selects the matching option and initiates its execution.

3.2 SELECTION LISTS

Selection lists are used to display a list of items and permit the user to choose one of the items from the list. The list appears in a window with one item per row. A single

item in the list is highlighted as a default. Examples of selection lists in the SME include the lists displayed for choosing the current project of interest and the desired measure for the project.

When the selection list is displayed, the item selected the last time the list was displayed by the user will normally be highlighted. For some uses, however, the first item in the list will be highlighted.

Pressing the <Enter> key selects the currently highlighted item and removes the selection list window from the screen. Pressing the <Esc> key aborts the selection process and removes the list from the screen.

If the selection list contains too many items to fit within the window, the window will be filled with the maximum number that can be displayed at one time. An indication will appear at the bottom of the window to let the user know that more items exist at the top and/or bottom of the list. When this situation occurs, the user may scroll or page the items to permit the entire list to be examined.

Cursor control keys may be used to move the highlighting from the current item to another desired item in the list as follows:

- The up arrow key moves the highlight up one item in the list, scrolling the items as needed.
- The down arrow key moves the highlight down one item in the list, scrolling the items as needed.

- The <Home> key moves the highlight to the first item in the list, paging to the top as needed.
- The <End> key moves the highlight to the last item in the list, paging to the bottom as needed.
- The <PgUp> key displays the previous page of the list, leaving the highlight at the same relative location within the window.
- The <PgDn> key displays the next page of the list, leaving the highlight at the same relative location within the window.

The highlight can also be moved to a particular item in a selection list by typing the first letter of the item. In cases where multiple entries in the selection list start with the same letter, the highlight moves downward to the next entry that starts with the entered letter.

A bell sounds when an attempt is made to scroll or page beyond the top or bottom of the selection list.

3.3 DISPLAY LISTS

Display lists are used to display a list of items and permit the user to browse the items in the list. As with selection lists, the list appears in a window with one item per row. Unlike selection lists, however, no mechanism exists for highlighting or selecting an item.

The items on each row often appear as a record of several related fields with column headers displayed over the fields. An example of one such display list in the SME is the table of phase estimates and past predictions displayed when the tabulate option is selected from the predict menu.

If the list cannot be displayed in its entirety within the window, full support is provided for scrolling and paging via the up arrow, down arrow, <Home>, <End>, <PgUp>, and <PgDn> keys. If the list can be displayed in its entirety, these keys have no effect.

Pressing the <Enter> or <Esc> key removes the display list window from the screen.

3.4 DATA ENTRY WINDOWS

Data entry windows are used by the SME to obtain numeric or character data from the user. One example of a data entry window in the SME occurs with the input of new phase estimates when the re-estimate option is selected from the predict menu (Section 5.4.6).

When the window is displayed, a column of data entry fields optionally filled with default values appears in the window. Each data entry field is labeled with a name or description identifying the item to be entered. The field for one of the items is highlighted.

Entry of an input value into a particular data entry field may be accomplished only when that field is highlighted.

Cursor control keys may be used to move the highlighting from the current field to another desired field as follows:

- The up arrow key moves the highlight up one field, wrapping to the field at the bottom of the screen as needed.
- The down arrow key moves the highlight down one field, wrapping to the field at the top of the screen as needed.

Once the desired field is highlighted, the user may begin entering the new value. As the first key is pressed, the original field value is erased and the user's keystrokes are echoed into the field. A highlighted cursor character is employed to indicate the location within the field for the next character entered. A bell sounds when any attempt is made to (1) enter more characters than the field will hold or (2) backspace while at the beginning of the field.

When data entry for the highlighted field is complete, the up and down arrow keys may be used to position to the next field. The entered value is validated at this point. If a problem is encountered, the field in error remains highlighted, and a message appears at the bottom of the data entry window explaining the error.

The user may abort the entry of a field at any time and restore the field's original value by pressing the <Home> key.

After all desired fields have been entered, the user should press the <Enter> key to save the new information. This causes the fields to be validated and a confirmation message to be issued before the data entry operation is terminated.

Pressing the <Esc> key at any time will abort the data entry operation and leave the data values unchanged.

NOTICE

This is DRAFT documentation containing information not yet considered final and complete.

SECTION 4 - SME EXECUTIVE FUNCTIONS

4.1 INITIALIZATION

Upon starting the SME on the VAX, an initial informational screen appears on the PC to identify the software and display which SME release is being used. A message at the bottom of the display instructs the user to "press return to continue."

After return has been pressed, the SME generates a second screen informing the user that the SME session is being initialized. At this point the SME is retrieving context information (Section 1.2) about the user's previous SME session, if available. First-time users receive valid default context values, and a message to this effect is generated.

After initialization for the user completes, the executive menu is displayed at the top of the screen. The menu contains eight options for selection: project, growth monitor, rate monitor, context, plan, assess, options, and quit. Initially, the project option is highlighted as a default. Figure 4-1 presents the executive menu. Section 3.1 presents detailed information on choosing options from a selection menu.

Project	Gmonitor	Rmonitor	context	plan	Assess	Options	Quit
Select a different project.							

Figure 4-1. Executive Menu

The SME consists of an executive structure and several major functions accessed from the executive level menu. The project, growth monitor, rate monitor, context, plan, assess, options, and quit functions are described below. Figure 4-2 shows a summary of the SME executive menu functions.

4.2 PROJECT

The project option permits the user to change the current project of interest. A pop-up window appears containing a selection list of all available projects. On the selection of a new project, the screen will be cleared of any previously drawn plot. Section 3.2 presents detailed information on choosing items from a selection list.

4.3 GROWTH MONITOR

The growth monitor option causes the growth monitor function to be executed for the current project of interest. The growth monitor is used to view and analyze a project's performance by plotting performance data for a selected measure (e.g., lines of code). Section 5 presents details of the growth monitor functions.

4.4 RATE MONITOR

The rate monitor option causes the rate monitor function to be executed for the current project of interest. The rate monitor is used to view and analyze a project's performance by plotting the cumulative ratio of two selected measures (e.g., reported errors/lines of code). Section 6 presents details of the rate monitor functions.

--- SME EXECUTIVE MENU ---	
Project	Select a different project.
Gmonitor	Monitor performance of a project using growth measures.
Rmonitor	Monitor performance of a project using rate measures.
context	Display summary of current context.
plan	Create a new plan (re-estimate).
Assess	Judge the health of the current project.
Options	Set display options for guidelines and plan, or set project date.
Quit	Save current environment and terminate SME.

Figure 4-2. SME Executive Menu Summary

4.5 CONTEXT

The context option displays a pop-up window containing a summary of the current context. At the executive menu this information consists of the current project of interest, the current plan name, and the manager's at-completion estimates for each performance measure. Normal estimates and actual current data values for each performance measure are also displayed, along with schedule information. Pressing the <Enter> or <Esc> key removes the context display.

4.6 PLAN

The plan option causes the planning function to be executed for the current project of interest. The planning function is used to create alternative project plans by enabling the user to modify schedules and estimates interactively. The planning function can also be used to load previously created alternative plans. Section 7 presents details of the planning functions.

4.7 ASSESS

The assess option causes the overall assessment function to be executed for the current project of interest. Overall assessment is used to view a project's general health by analyzing and displaying project attributes (e.g., reliability, maintainability). Section 8 presents details of the overall assessment functions.

4.8 OPTIONS

The options selection enables the user to modify certain SME display parameters. The user can govern whether the SME displays the measure guidelines and/or a model of the manager's planned growth. The user can also set a project date, which governs which baseline plan the SME uses for plotting and truncates performance data to emulate the state of the project on that date. Section 9 presents details on these functions.

4.9 QUIT

The quit option ends the SME session. If any modifications to the project plan have been made and the plan has not been stored, a message is displayed asking if the user wants to store the plan. If the user replies yes, the user is put in the planning function store option (Section 7.2.4). If the user answers no, a message is displayed asking for confirmation before proceeding with the termination process. If no plan modifications have been made, the termination confirmation is displayed directly.



NOTICE
This is DRAFT documentation containing information not yet considered final and complete.

SECTION 5 - GROWTH MONITOR FUNCTIONS

The growth monitor is used to view and analyze a project's performance by plotting performance data for a selected measure (e.g., lines of code). The following sections detail the use of the growth monitor functions.

5.1 GENERAL INFORMATION

On entry into the growth monitor function, two actions occur before the growth monitor menu appears.

First, a pop-up window appears containing a selection list of all available measures for the current project of interest. The current measure, set from information in the context, is highlighted and may be changed by selecting a new measure from the list. Section 3.2 presents detailed information on choosing items from a selection list.

Second, the SME generates a plot of the performance data for the selected measure of the current project of interest. Figure 5-1 shows a sample plot. Table 5-1 explains the phase codes at the top of Figure 5-1.

Table 5-1. Phase Name Codes

Coded Name	Life-cycle Phase
DESGN	Design
CODET	Code and test
SYSTE	System test
ACCTE	Acceptance test

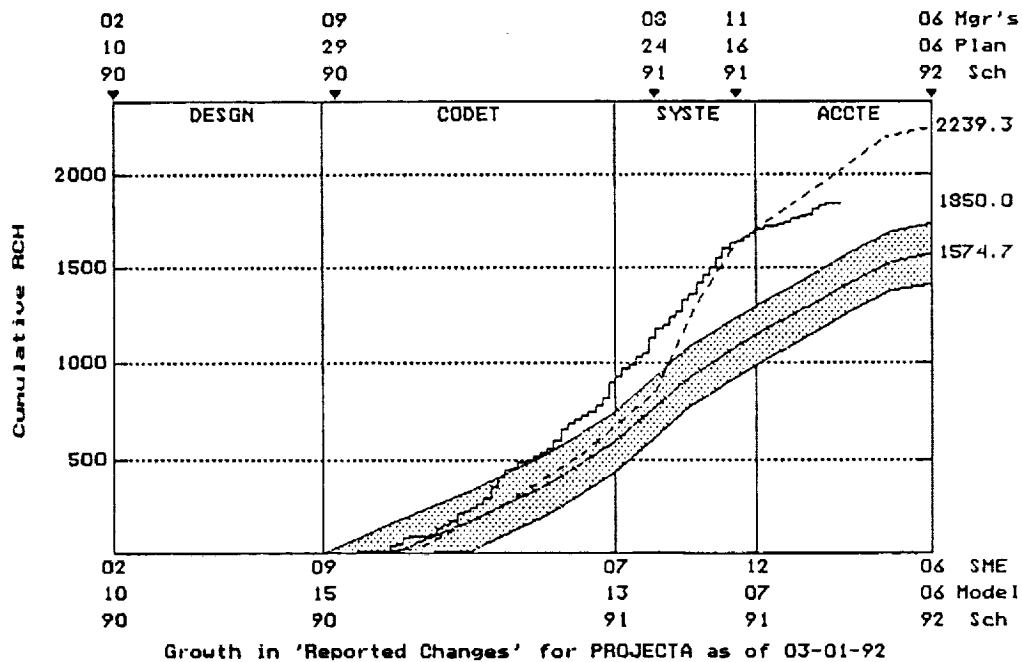


Figure 5-1. Sample Growth Monitor Plot

The growth monitor plot has the following features:

- The measure type, project name, and project date appear in the plot title.
- The SME schedule template for the four lifecycle phases is displayed across the bottom edge of the plot; the manager's schedule is displayed across the top edge of the plot, along with the phase names.
- Optional guidelines (Section 9.2) representing a model of a typical project are shown as a blue-shaded region with the nominal, minimum, and maximum expected growth curves for the measure

highlighted in light blue. The guidelines are labeled on the right edge of the plot in blue with a value the SME considers normal for the measure for a project of this magnitude.

- The manager's projected growth for the measure is optionally displayed (Section 9.3) on the plot as a dashed yellow line, and labeled on the right edge with the manager's estimated completion value for the measure.
- The project's performance data for the current measure is shown as a green line that conforms to the step-wise, weekly growth of the measure, and is labeled on the right side of the plot with the current actual value for the measure.
- Dotted lines appear horizontally on the plot at regular intervals to indicate the plot scale and are labeled along the left edge of the plot.

After <Enter> or <Esc> is pressed, the growth monitor menu appears at the top of the screen. The menu contains nine options for selection: view, measure, compare, context, predict, profile, assess, estimates, and quit. Initially, the view option is highlighted as a default. Figure 5-2 presents the growth monitor menu.

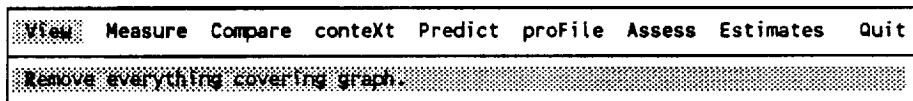


Figure 5-2. Growth Monitor Menu

5.2 GROWTH MONITOR MENU OPTIONS

The following sections describe the view, measure, compare, context, predict, profile, assess, estimates, and quit options.

5.2.1 VIEW

The view option temporarily removes the growth monitor menu from the screen to uncover the entire plotting area. Once the plot is uncovered, pressing any key restores the menu.

5.2.2 MEASURE

The measure option permits the user to change the current growth measure. A pop-up window appears containing a selection list of all available measures for the current project of interest. Any measure on the list may be selected. Section 3.2 presents detailed information on choosing items from a selection list.

If the user selects a new measure, the current plot is erased and replaced with a new plot of the selected measure. Pressing <Enter> or <Esc> will restore the growth monitor menu.

5.2.3 COMPARE

The compare option causes the growth monitor compare function to be executed. The compare function is discussed in detail in Section 5.3.

5.2.4 CONTEXT

The context option of the growth monitor menu displays a window that presents information summarizing the current measure and schedule. The display presents schedule information about the project of interest, including the current date (or completion date for a finished project) and estimated completion date, the project's schedule duration expressed in number of weeks, the number of weeks of the schedule that have elapsed to date, and the current week number and total number of weeks expressed as percentages of the total schedule duration. The display also contains information relevant to the current growth measure, such as the measure value, the value expected on this date (with respect to the guidelines), and the manager's estimate at completion. The values are also displayed as percentages of the manager's at-completion estimate. Pressing <Enter> or <Esc> returns the user to the growth monitor menu.

5.2.5 PREDICT

The predict option causes the growth monitor prediction function to be executed. This is discussed in detail in Section 5.4.

5.2.6 PROFILE

The profile option of the growth monitor permits the user to view profile information for the currently selected growth measure. A profile is a decomposition of a measure into elemental components. For example, the total number of reported errors for a project can be broken down into number of errors that took less than 1 hour to isolate, the number of errors that took between 1 and 3 hours to isolate, and so forth. If profile data is available, a pop-up window appears containing a selection list of the available profile types. The user can select the desired type using the selection methods described in Section 3.2.

Upon selecting a profile type, a window containing a horizontal bar graph is generated. Each of the components for the selected profile is represented by a pair of bars on the graph. The upper bar (in green) represents the actual reported number of cases for that component to date. The lower bar (in light blue) represents the estimated number of cases at project completion for the component based on a model of that profile type. A red line appears on the lower bar to indicate the expected number of cases for the component to date. The actual data values are displayed next to their corresponding graph bars. Pressing the <Enter> or <Esc> key removes the bar graph window and restores the previously existing growth measure plot.

5.2.7 ASSESS

The assess option causes the growth monitor assessment function to be executed. This is discussed in detail in Section 5.5.

5.2.8 ESTIMATES

The estimates option causes the estimate function to be executed. This is discussed in detail in Section 5.6.

5.2.9 QUIT

The quit option removes the growth monitor menu and returns the user to the executive menu.

5.3 GROWTH MONITOR COMPARE FUNCTION

The growth comparison function plots performance data from other projects for the current measure. The points plotted are normalized to the duration and completion value of the original project and added to the current plot. The following sections detail the use of the growth comparison function.

5.3.1 GENERAL INFORMATION

On entry into the growth comparison function, the growth comparison menu is displayed at the top of the screen. The growth comparison menu contains four options for selection: view, project, context, and quit. Initially, the project option is highlighted as a default. Figure 5-3 presents the growth comparison menu.

View	Project	conTeXt	Quit
Plot a comparison project.			

Figure 5-3. Growth Comparison Menu

The view, project, context, and quit selections are described below.

5.3.2 VIEW

The view option temporarily removes the growth comparison menu from the screen to uncover the entire plotting area. Once the plot is uncovered, pressing any key restores the menu.

5.3.3 PROJECT

The project option permits the user to select a project for comparison with the current project. A pop-up window appears containing a selection list of all projects that have data for the current measure. Any project on the list may be selected. Section 3.2 presents detailed information on choosing items from a selection list.

If the user selects a comparison project, the growth comparison menu is removed, the current plot is redrawn, and the performance data for the selected project (and each subsequent comparison project) is added to the plot. Figure 5-4 presents a sample growth comparison plot.

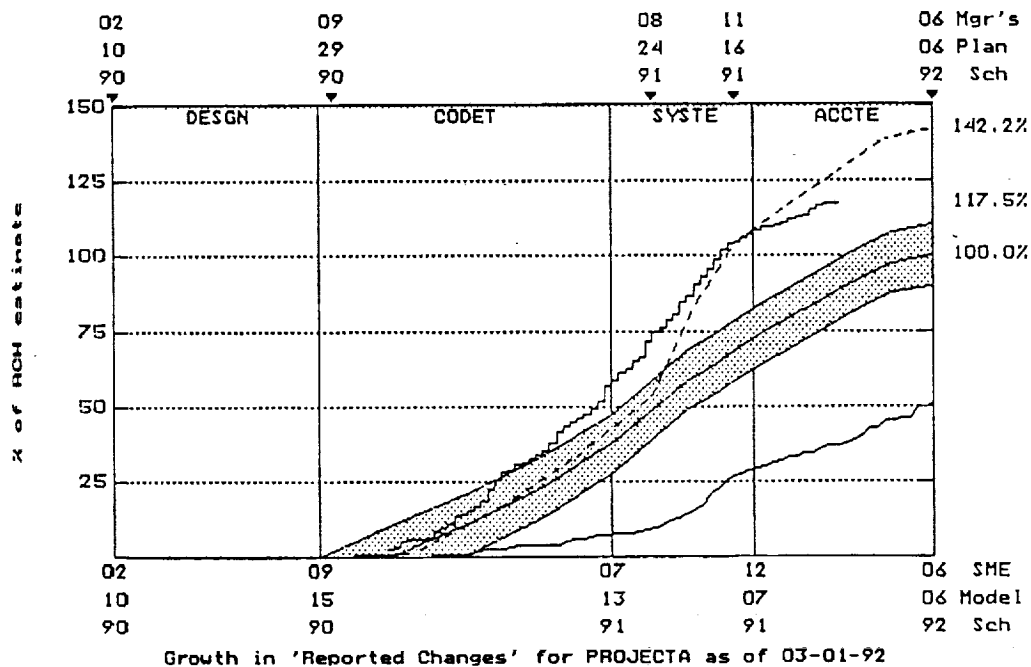


Figure 5-4. Sample Growth Comparison Plot

The growth comparison plot has the following features:

- The measure type, project name, and project date appear in the plot title.
- The SME schedule template for the four life cycle phases is displayed across the bottom edge of the plot; the manager's schedule is displayed across the top edge of the plot, along with the phase names.
- Optional guidelines (Section 9.2) representing a model of a typical project are shown as a blue-shaded region with the nominal, minimum, and maximum expected growth curves for the measure

highlighted in light blue. These guidelines are labeled on the right edge of the plot in blue as 100 percent of what the SME considers normal for the measure for a project of this magnitude.

- The manager's projected growth for the measure is optionally displayed (Section 9.3) on the plot as a dashed yellow line, and labeled on the right edge with the manager's estimated completion value for the measure represented as a percentage of the guideline, or normal value.
- The project's performance data for the current measure is shown as a green line that conforms to the step-wise, weekly growth of the measure, and labeled on the right side of the plot with the current actual value for the measure represented as a percentage of the guideline value.
- The performance data for the comparison project is shown on the plot as a solid line drawn to that project's actual value with respect to its own normal value for the measure.
- Dotted lines appear horizontally on the plot at regular intervals (typically every 25 percent) to indicate the plot scale and are labeled along the left edge of the plot.

5.3.4 CONTEXT

The context option displays a pop-up window containing a legend of all comparison projects that have been plotted, including the project name and color and pattern used to display the projects on the comparison plot. Pressing the <Enter> or <Esc> key removes the context display.

5.3.5 QUIT

The quit option removes the growth comparison menu and returns the user to the growth monitor menu.

5.4 GROWTH MONITOR PREDICT FUNCTION

The predict function allows the user to predict the future growth expected for the current performance measure. The following sections detail the use of the predict function.

5.4.1 GENERAL INFORMATION

The predict function of the growth monitor causes four pop-up windows to appear, three for display and one for selection. The three windows that appear across the top of the screen describe the methods available to the user for calculating a prediction, and the bottom window enables the user to select one of these methods.

The upper-left window displays information that will be used to calculate the prediction if the user chooses to base the prediction on SME data. If selected, the SME will take an average of all performance data available for the project of

interest in order to arrive at a schedule, and then calculate a prediction for the growth of the current measure based on that schedule.

The upper-middle window enables the user to view information that was used to calculate the last prediction.

The upper-right window presents information that will be used if the last completed SEL data base phase is selected as the basis for prediction.

The bottom window allows the user to select one of the options displayed as the basis for predicting the growth of a measure. The window also enables the user to create a phase estimate as the basis for prediction by selecting the edit option. Each phase estimate supplied by the user consists of three values as follows:

- Date--A date corresponding to a Friday in the format MM-DD-YY specifying the point in the project schedule on which the estimate is to be applied
- Phase name--A coded name for a life-cycle phase indicating the user's estimation of the project's phase on the above date
- Percentage complete--A value indicating the user's estimation of the fraction of the project's phase that is complete on the above date

Refer to table 5-1 for valid phase name values for a user's estimate.

The user inputs values for the estimate's date, phase name, and percentage complete in a data entry window that appears on the screen. Section 3.4 presents details on data entry window operations.

Each input value entered by the user is validated as follows:

- Date--Must be a valid date in the format MM-DD-YY that is between the start of design and the date of the most recent performance data (note that the date will be changed automatically to the Friday of the week in which the date falls)
- Phase name--Must be selected from the list of valid phase name codes defined in Table 5-1
- Percentage complete--Must be an integer in the inclusive range 0 to 100

Once a basis exists for the prediction, the SME generates a plot of the performance data for the current measure and displays the predicted growth of the measure from the estimate date to the end of the project. Figure 5-5 shows a sample of such a plot.

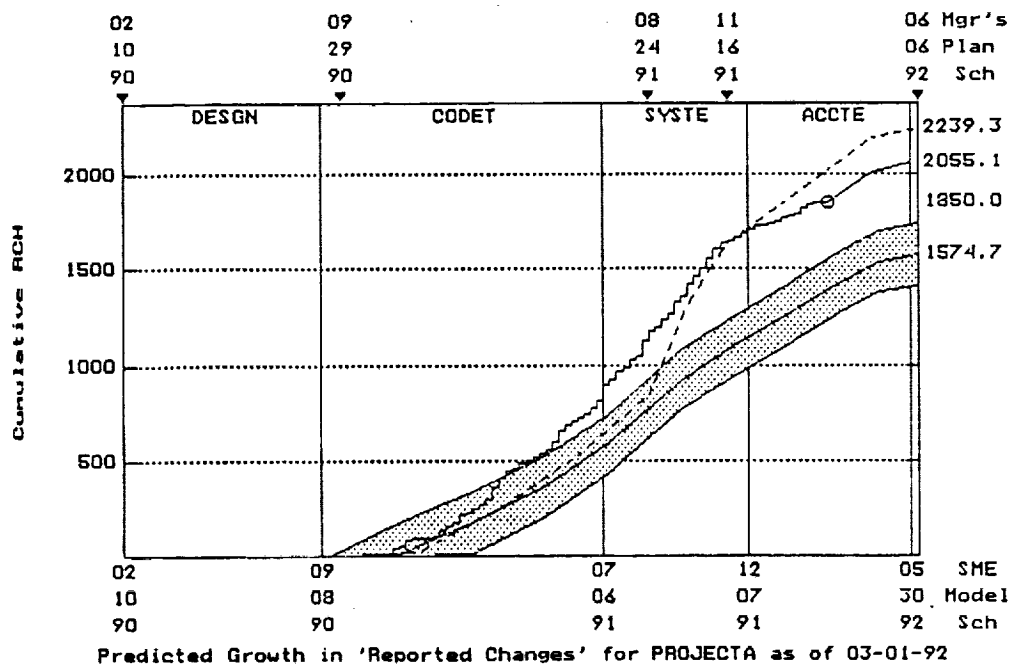


Figure 5-5. Sample Prediction Plot

The prediction plot has the following features:

- The project name, performance measure, and project date are contained in the plot title. The performance measure also appears to the left of the Y-axis on the plot.
- The SME schedule template for the four life-cycle phases is displayed across the bottom edge of the plot. This schedule may vary depending on what method was used to calculate the prediction.
- The manager's schedule is displayed across the top of the plot, along with the phase names.

- Optional guidelines (Section 9.2) representing a model of a typical project are shown as a blue-shaded region with the nominal, minimum, and maximum expected growth curves for the measure highlighted in light blue.
- The manager's projected growth for the measure is optionally displayed (Section 9.3) on the plot as a dashed yellow line.
- The project's performance data for the current measure is shown as a green line that conforms to the step-wise, weekly growth of the measure.
- The predicted growth of the measure is plotted from the date used as a basis for the prediction to the predicted end of the project as a red curve.
- The predicted at-completion value, the SME guideline value, the manager's estimated at-completion value, and the most recent value for the measure appear to the right of the plot in red, light blue, yellow, and green, respectively.

After <Enter> or <Esc> is pressed, the predict menu appears at the top of the screen. The predict menu contains six options for selection: view, tabulate, history, display, re-estimate, and quit. Initially, the tabulate option is highlighted as a default. Figure 5-6 presents the predict menu.

View	Tabulate	History	Display	Re-est	Quit
Display list of historical predictions.					

Figure 5-6. Predict Menu

The view, tabulate, history, display, re-estimate, and quit selections are described below.

5.4.2 VIEW

The view option temporarily removes the predict menu from the screen to uncover the entire plotting area. Once the plot is uncovered, pressing any key restores the menu.

5.4.3 TABULATE

The tabulate option displays a pop-up window containing a list of all phase estimates made by the user for the project to date. For each entry in the list, the estimated values for date, phase name, and percentage complete are displayed with the corresponding predictions of the project completion date and the at-completion value of the measure. If the list of phase estimates cannot be displayed entirely within the window, the list may be scrolled or paged as described in Section 3.3. Pressing the <Enter> or <Esc> key removes the list and restores the predict menu.

5.4.4 HISTORY

The history option plots the results of predictions based on all previous phase estimates made by the user to date. The predict

menu is removed, and the predicted at-completion value for each estimate is plotted as a function of the date on which the estimate was based. These values are displayed directly on the prediction plot and show the trend in the predicted completion values with time. Pressing any key restores the predict menu.

5.4.5 DISPLAY

The display option causes three windows to appear on the screen containing additional information that summarizes the most recent prediction as follows:

- The upper-left window displays the phase estimate that served as the basis for the prediction. The value of the performance measure for the date on which the estimate was based is also shown.
- The upper-right window compares the prediction completion value with the manager's at-completion estimate from the SEL data base.
- The bottom window summarizes the prediction at each phase transition. The manager's estimated phase end date, the predicted phase end date, and the predicted measure value at phase end are listed.

Pressing the <Enter> or <Esc> key removes the windows and returns to the predict menu.

5.4.6 RE-ESTIMATE

The re-estimate option causes a return to the four initial pop-up windows, which allows the user to change the basis for prediction if desired.

5.4.7 QUIT

The quit option removes the predict menu and returns the user to the growth monitor menu.

5.5 GROWTH MONITOR ASSESS FUNCTION

The assess function allows the user to view possible or known explanations for a project's deviation from an expected range. The following sections detail the use of the assess function.

5.5.1 GENERAL INFORMATION

The assess option of the growth monitor causes a pop-up window to appear containing information relevant to the project's performance for the current measure with respect to the guidelines. If no deviation is found, an informational message to that effect is displayed. Pressing any key returns the user to the growth monitor menu.

If a deviation is found, the pop-up window will contain known or possible explanations for the deviation. Pressing the <Esc> key at this point will return the user to the growth monitor menu. Pressing the <Enter> key causes the trend assessment menu to be displayed. The trend assessment menu has five options for selection: view, see explanations, display factors, rate

subjectives, and quit. Initially, the see explanations option is highlighted as a default. Figure 5-7 presents the assess menu.

View	See explanations	Display factors	Rate subjectives	Quit
Display all explanations related to the deviation for the measure				

Figure 5-7. Assess Menu

The view, see explanations, display factors, rate subjectives, and quit selections are described below.

5.5.2 VIEW

The view option temporarily removes the trend assessment menu from the screen to uncover the entire plotting area. Once the plot is uncovered, pressing any key restores the menu.

5.5.3 SEE EXPLANATIONS

Choosing the see explanations feature of the trend assessment menu causes a pop-up window to be generated containing all potential explanations related to the deviation in the current measure. The maximum and actual relative rank displayed for each explanation in the list indicate the importance and probability of the reason in explaining the deviation. A positive ranking indicates that the reason is likely; a zero ranking indicates that the reason is possible; a negative ranking indicates that the reason is not probable. Pressing <Enter> or <Esc> returns the user to the trend assessment menu.

5.5.4 DISPLAY FACTORS

This option of the trend assessment menu enables the user to display all the factors affecting the explanations for the deviation. The factor name is displayed, along with the factor type (subjective, objective, or dependent), the rating (unknown, low, normal, or high), and the certainty of the current rating. If the entire list of factors cannot be displayed entirely within the window, the list may be scrolled or paged as described in Section 3.3. Pressing the <Enter> or <Esc> key removes the list and restores the trend assessment menu.

5.5.5 RATE SUBJECTIVES

This option of the trend assessment menu enables the user to view or modify the current ratings of subjective factors affecting the explanations for the deviation. A pop-up window appears containing possible subjective factors, with the first factor highlighted. The user may select any factor that appears in the window to view or change. Upon making a selection, a second pop-up window appears containing the factor selected and its current rating. At this point the user may change the rating by selecting unknown, low, normal, or high and pressing <Enter>, or may return to the trend assessment menu by pressing the <Esc> key.

5.5.6 QUIT

The quit option removes the trend assessment menu and returns the user to the growth monitor menu.

5.6 GROWTH MONITOR ESTIMATES FUNCTION

The estimates function allows the user to view all the estimates that were made by the manager to date for the current measure. The following sections detail the use of the estimates function.

5.6.1 GENERAL INFORMATION

On entry into the estimates function, the estimates menu is displayed at the top of the screen. The estimates menu contains four options for selection: view, history, tabulate, and quit. Initially, the view option is highlighted as a default. Figure 5-8 presents the estimates menu.

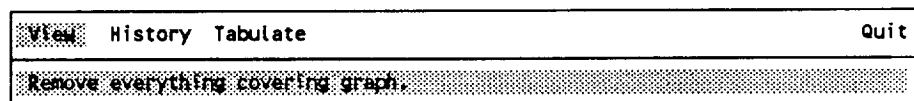


Figure 5-8. Estimates Menu

The view, history, tabulate, and quit selections are described below.

5.6.2 VIEW

The view option temporarily removes the estimates menu from the screen to uncover the entire plotting area. Once the plot is uncovered, pressing any key restores the menu.

5.6.3 History

The history option plots all the manager's estimates made to date for the current measure. The estimates menu is removed, and the estimated at-completion values for the measure are plotted as a function of the date on which each estimate was made. These values are displayed directly on the growth monitor plot and show the trends in the estimated completion values over time. Pressing <Enter> or <Esc> restores the estimates menu.

5.6.4 Tabulate

The tabulate option displays a pop-up window containing a list of all estimates made for the measure to date. All estimated completion values and corresponding dates made are displayed. If the list of estimates cannot be displayed entirely within the window, the list may be scrolled or paged as described in Section 3.3. Pressing the <Enter> or <Esc> key removes the list and restores the estimates menu.

5.6.5 Quit

The quit option removes the estimates menu and returns the user to the growth monitor menu.

SECTION 6 - RATE MONITOR FUNCTIONS

The rate monitor is used to view and analyze a project's performance by plotting the cumulative ratio of two selected measures (e.g., reported errors/lines of code). The following sections detail the use of the rate monitor functions.

6.1 GENERAL INFORMATION

When the rate monitor function is selected from the SME executive menu, a pop-up window appears containing a selection list (Section 3.2) of all available measures for the project of interest. The current rate measure, initially set from information in the context, appears at the top of the window. This rate measure consists of a pair of measures that serve as the numerator and denominator of the ratio to monitor. To change the current rate measure, the user first selects the measure to be used as the numerator from the list. A second selection list of the remaining available measures will then appear for choosing the denominator. Once the selection is made, the SME generates a plot of the cumulative ratio of the performance data for the two measures selected. Figure 6-1 shows a sample plot.

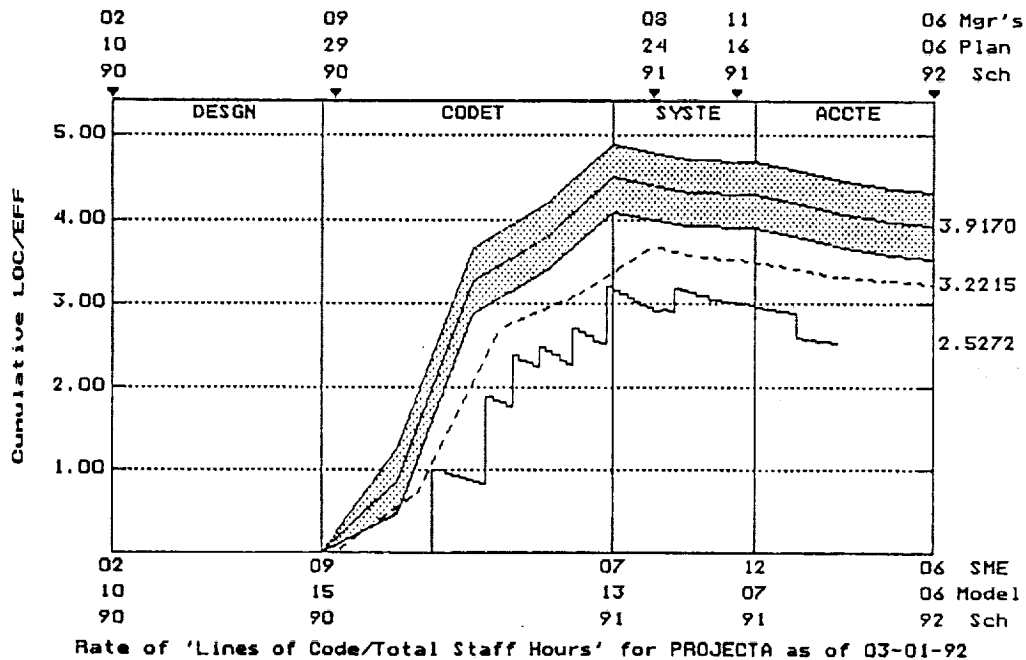


Figure 6-1. Sample Rate Monitor Plot

The rate monitor plot has the following features:

- The ratio type, project name, and project date appear in the plot title.
- The SME schedule template for the four lifecycle phases is displayed across the bottom edge of the plot; the manager's schedule is displayed across the top edge of the plot, along with the phase names.
- Optional guidelines (Section 9.2) representing a model of a typical project are shown as a blue-shaded region with the nominal, minimum, and maximum expected growth curves for the ratio of the measures highlighted in light blue. The guidelines

are labeled in on the right edge of the plot in blue with what the SME considers normal for the rate for a project of this type.

- The ratio of the manager's projected growth for the two measures is optionally displayed (Section 9.3) on the plot as a dashed yellow line, labeled in yellow at the right edge of the plot with the ratio of the manager's completion estimates.
- The project's performance data for the ratio of the two measures is shown as a green line that conforms to the step-wise, weekly growth of the cumulative ratio.
- The most recent value for the ratio of the measures appears in green at the plot's rightmost edge to indicate the actual magnitude of the ratio attained to date.
- Dotted lines appear horizontally on the plot at regular intervals to show the plot scale and are labeled along the left edge of the plot.

After pressing <Enter> or <Esc>, the rate monitor menu appears at the top of the screen. The rate monitor menu contains seven options for selection: view, measure, compare, context, assess, estimates, and quit. Initially, the view option is highlighted as a default. Figure 6-2 presents the rate monitor menu.

View	Measure	Compare	contexT	Assess	Estimates	Quit
Remove everything covering graph.						

Figure 6-2. Rate Monitor Menu

6.2 RATE MONITOR MENU OPTIONS

The following sections describe the view, measure, compare, context, assess, estimates, and quit options.

6.2.1 VIEW

The view option temporarily removes the rate monitor menu from the screen to uncover the entire plotting area. Once the plot is uncovered, pressing any key restores the menu.

6.2.2 MEASURE

The measure option permits the user to change the pair of measures the rate monitor will use as the numerator and denominator for the cumulative ratio. Selecting the option causes a pop-up window to appear containing a list of all available measures for the current project of interest. After the measure to be used as the numerator is selected from the initial list, a second selection list of the remaining available measures appears in the window to permit the selection of a measure to be used as the denominator. Section 3.2 presents detailed information on choosing items from a selection list.

If the user changes one or both of the measures, the current plot is erased and replaced with a plot of the cumulative ratio for the newly selected rate measure. Pressing <Enter> or <Esc> will restore the rate monitor menu.

6.2.3 COMPARE

The compare option of the rate monitor menu causes the rate comparison function to be executed. This is discussed in detail in Section 6.3.

6.2.4 CONTEXT

Like the context option of the growth monitor (Section 5.2.4), the context option of the rate monitor menu displays a window that presents information summarizing the current measure and schedule, except in this case the measure is actually a ratio of two measures. The display presents schedule information about the project of interest, including the current date (or completion date for a finished project) and estimated completion date, the project's schedule duration expressed in number of weeks, the number of weeks of the schedule that have elapsed to date, and the current week number and total number of weeks expressed as percentages of the total schedule duration. The display also contains information relevant to the current ratio of measures, such as the ratio value, the value expected on this date (with respect to the guidelines), and the ratio of the manager's estimates for the measures at completion. The values are also displayed as percentages of the completion estimate. Pressing <Enter> or <Esc> returns the user to the rate monitor menu.

6.2.5 ASSESS

Use of the assess option requires that the SME be running in expert mode, thereby providing access to the SME LISP-based expert system (Section 2.2). By interpreting specific project measure ratios, the expert system generates an analysis of general project trends that deviate from model guidelines. When the user chooses the assess option of the rate monitor menu, a pop-up window appears and a ranked list of the three most likely explanations for any deviation is displayed. Pressing the <Esc> key at this point returns the user to the rate monitor menu. Pressing the <Enter> key causes a new window to open, which contains a list of all possible explanations for deviation from guidelines. A "certainty" value (ranging from 0.00 to 0.99) indicating the validity of the explanation is listed with each explanation. If the list of explanations cannot be displayed entirely within the window, the list may be scrolled or paged as described in Section 3.3. Pressing the <Enter> or <Esc> key returns the user to the rate monitor menu.

6.2.6 ESTIMATES

The estimates option causes the estimate function to be executed. This is discussed in detail in Section 6.4.

6.2.7 QUIT

The quit option removes the rate monitor menu and returns the user to the SME executive menu.

6.3 RATE MONITOR COMPARE FUNCTION

The rate comparison function is similar to the growth comparison function (Section 5.3) in that it plots performance data from other projects on the current plot. However, instead of plotting a single measure's performance data, the rate comparison function plots performance data as a cumulative ratio of the current measures. The following sections detail the use of the rate comparison function.

6.3.1 GENERAL INFORMATION

On entry into the rate comparison function, the rate comparison menu is displayed at the top of the screen. As with the growth comparison menu, the rate comparison menu contains four options for selection: view, project, context, and quit. Initially, the project option is highlighted as a default. Figure 6-3 presents the rate comparison menu.

View	Project	conTeXt	Quit
Plot a comparison project.			

Figure 6-3. Rate Comparison Menu

This release of the SME supports all options displayed in the selection menu. These selections are described below.

6.3.2 VIEW

The view option temporarily removes the rate comparison menu from the screen to uncover the entire plotting area. Once the plot is uncovered, pressing any key restores the menu.

6.3.3 PROJECT

The project option permits the user to select a project for comparison with the current project. A pop-up window appears containing a selection list of all projects that have data for both the current measures. Any project on the list may be selected. Section 3.2 presents detailed information on choosing items from a selection list.

If the user selects a comparison project, the rate comparison menu is removed and the performance data for the selected project is added to the current plot. Pressing any key restores the rate comparison menu. Figure 6-4 presents a sample rate comparison plot.

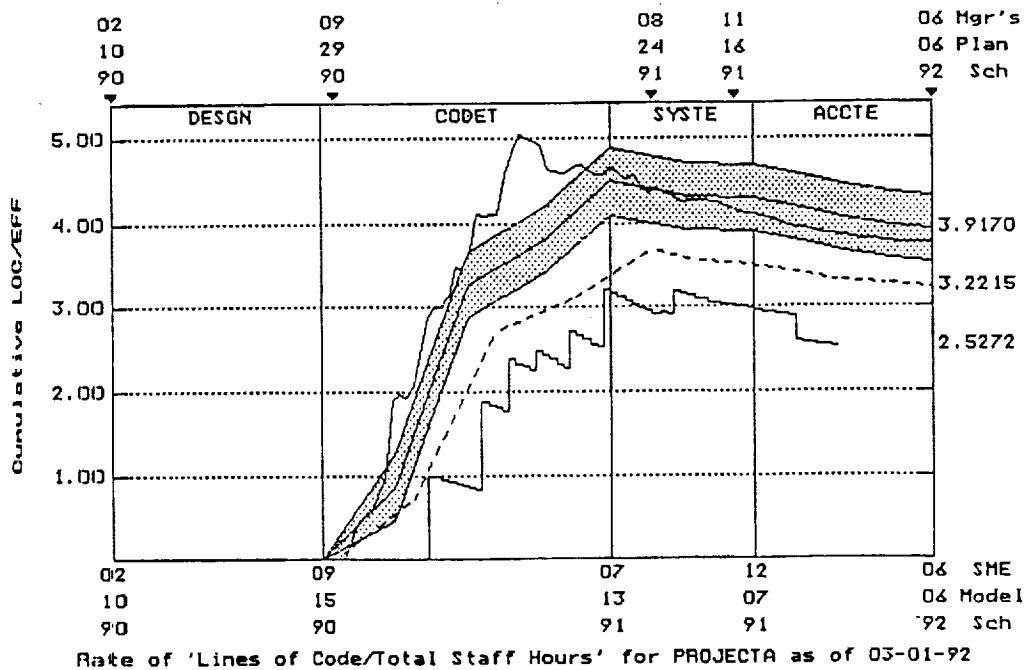


Figure 6-4. Sample Rate Comparison Plot

The rate comparison plot has the following features:

- The ratio type, project name, and project date appear in the plot title.
- The SME schedule template for the four life-cycle phases is displayed across the bottom edge of the plot; the manager's schedule is displayed across the top edge of the plot, along with the phase names.
- Optional guidelines (Section 9.2) representing a model of a typical project are shown as a blue-shaded region with the nominal, minimum, and maximum expected growth curves for the ratio of the measures highlighted in light blue. The guidelines

are labeled in on the right edge of the plot in blue with what the SME considers normal for the rate for a project of this type.

- The ratio of the manager's projected growth for the two measures is optionally displayed (Section 9.3) on the plot as a dashed yellow line, labeled in yellow at the right edge of the plot with the ratio of the manager's completion estimates.
- The project's performance data for the ratio of the two measures is shown as a green line that conforms to the step-wise, weekly growth of the cumulative ratio, and labeled on the right edge of the plot with the current actual value of the ratio.
- The performance data for the comparison project is shown on the plot as a solid line drawn to the current actual ratio value for that comparison project.
- Dotted lines appear horizontally on the plot at regular intervals and are labeled along the left edge of the plot.

6.3.4 CONTEXT

The context option displays a pop-up window containing a legend of all comparison projects that have been plotted, including the project name and color and pattern used to display the projects on the comparison plot. Pressing the <Enter> or <Esc> key removes the context display.

6.3.5 QUIT

The quit option removes the rate comparison menu and returns the user to the rate monitor menu.

6.4 RATE MONITOR ESTIMATES FUNCTION

The estimates function allows the user to view all the estimates that were made by the manager to date for the current measure. The following sections detail the use of the estimates function.

6.4.1 GENERAL INFORMATION

On entry into the estimates function, the estimates menu is displayed at the top of the screen. The estimates menu contains four options for selection: view, history, tabulate, and quit. Initially, the view option is highlighted as a default. Figure 6-5 presents the estimates menu.

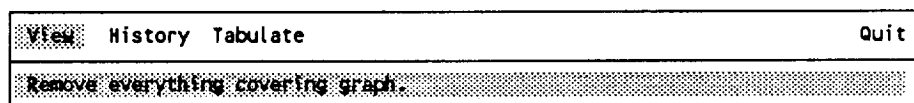


Figure 6-5. Estimates Menu

The view, history, tabulate, and quit selections are described below.

6.4.2 VIEW

The view option temporarily removes the estimates menu from the screen to uncover the entire plotting area. Once the plot is uncovered, pressing any key restores the menu.

6.4.3 History

The history option plots the ratios of all the manager's estimates for the current measures made to date. The estimates menu is removed, and the ratio of the estimated at-completion values for the measures is plotted as a function of the date on which the estimates were made. These values are displayed directly on the rate monitor plot and show the trend in the estimated completion values with time. Pressing <Enter> or <Esc> restores the estimates menu.

6.4.4 Tabulate

The tabulate option displays a pop-up window containing a list of ratios of all estimates made for the measures to date. All estimated completion values and corresponding dates made are displayed. If the list of estimates cannot be displayed entirely within the window, the list may be scrolled or paged as described in Section 3.3. Pressing the <Enter> or <Esc> key removes the list and restores the estimates menu.

6.4.5 Quit

The quit option removes the estimates menu and returns the user to the rate monitor menu.

SECTION 7 - PLANNING FUNCTION

The planning function provides features that enable the user to create alternative plans interactively. A plan consists of a schedule and a set of completion estimates. The function also enables the user to save and delete these alternative plans. The following sections describe the planning function in detail.

7.1 GENERAL INFORMATION

When the planning function is selected from the SME executive menu, the planning function menu is displayed at the top of the screen. The planning function menu contains seven options for selection: view, load, update, store, delete, context, and quit. Initially, the view option is highlighted as a default. Figure 7-1 presents the planning function menu.

View	Load	Update	Store	Delete	conTeXt	Quit
Remove everything covering graph.						

Figure 7-1. Planning Function Menu

7.2 PLANNING FUNCTION MENU OPTIONS

The following sections describe the view, load, update, store, delete, context, and quit options.

7.2.1 VIEW

The view option temporarily removes the planning function menu from the screen to uncover the entire plotting area. Once the plot is uncovered, pressing any key restores the menu.

7.2.2 LOAD

The load option of the planning function menu enables the user to load either the current baseline plan or a previously created alternative plan. When the load option is selected, a pop-up window appears containing a choice between loading the baseline plan, or loading an alternative plan. If the user selects baseline, the current baseline planning information is displayed in a pop-up window. At this point the user can confirm loading the baseline (by pressing <Enter> or "y") or abort the operation (by pressing <Esc> or "n").

If the user selects the alternative plan option, a pop-up window appears containing a list of all the alternative plans previously created by the user, if any. If there are no alternative plans, the SME generates a message to that effect. If the user selects an alternative plan from the list, the planning information is displayed in a pop-up window. As with the baseline plan, the user can now confirm loading the alternative plan or abort the operation.

7.2.3 UPDATE

The update option of the planning function menu enables the user to create alternative project plans by interactively modifying the schedule and/or completion estimate values. When the update option is selected, a pop-up window appears prompting the user to choose either the estimates or schedule for modification. The following sections describe how the estimates and schedule can be modified to create alternative project plans.

7.2.3.1 MODIFYING ESTIMATES

Estimate values can be modified in one of two ways: by editing estimate values individually, or by supplying a value for a single measure and having the SME supply completion estimates for the remaining measures by using a model. When the user selects the estimates option from the plan update function, a pop-up window appears prompting the user to select one of these two methods.

The first method, edit, enables the user to enter values for any or all individual measures. See Section 3.4 for detailed information on using data entry windows. When the user is finished editing, pressing return causes a confirmation prompt to appear. Pressing <Enter> or "y" will cause the SME to save the estimate values as edited by the user. Pressing <Esc> or "n" causes the SME to abort the process and restore the original values.

The second method, model, enables the user to create a set of completion estimates by entering a value for a single measure

and having the SME create the estimate set by applying that value to an estimation model. First the user is prompted to select a measure on which to base the estimate set. Next the user supplies a value for that measure. After the user has supplied the value, the SME generates the estimate set and displays the set in a pop-up window. Pressing <Enter> or "y" will cause the SME to save the estimate values created from the model. Pressing <Esc> or "n" causes the SME to abort the process and restore the original values.

7.2.3.2 MODIFYING SCHEDULES

As with estimates, schedules can be modified in one of two ways: by editing each individual phase date (except project start), or by supplying a project end date and having the SME supply dates for the other phases based on a model. When the user selects the schedule option from the plan update function, a pop-up window appears prompting the user to select one of these two methods.

The first method, edit, enables the user to enter values for each project phase date except the start of the design phase. See Section 3.4 for detailed information on using data entry windows. The dates entered must be chronological by phase, and the project end date may not be before the date of the most recent project data. If the user enters an invalid date, a message is displayed advising the user of the error. When the user is finished editing the schedule, pressing return causes a confirmation prompt to appear. Pressing <Enter> or "y" will cause the SME to save the schedule as edited by the user. Pressing <Esc> or "n" causes the SME to abort the process and restore the original values.

The second method, model, enables the user to create a schedule by entering an end date for the project and having the SME create the schedule by applying that date (and the project start date) to a schedule model. As with editing a schedule, the date entered may not fall before the date of the most recent project data. After the user has supplied the date, the SME generates and displays the schedule in a pop-up window. Pressing <Enter> or "y" will cause the SME to save the schedule created from the model. Pressing <Esc> or "n" causes the SME to abort the process and restore the original values.

7.2.4 STORE

The store option of the planning function menu allows the user to write the currently loaded plan to disk, thus saving the plan for future use. When the store option is selected from the planning function menu, a pop-up window appears containing a list of previously created alternative plan names, if any. The user can select a plan name from this list, or create a new plan name.

If the user selects a plan name from the list and confirms the store process, the SME writes the currently loaded schedule and estimate set to the disk file containing the previous version of the plan selected; thus, the previous version of that plan will be overwritten.

Alternatively, the user can save the current schedule and estimate set on disk under a new plan name by pressing <Esc> and supplying a new 10-character (maximum) plan name. After the user confirms the process, the SME writes the information

to disk under the new plan name. This plan can be subsequently reloaded by using the load option, described in section 7.2.2 above.

7.2.5 DELETE

The delete option of the planning function menu allows the user to delete previously created and stored alternative plans. When the delete option is selected from the planning function menu, a pop-up window appears with a list of alternative plan names, if any. If there are no alternative plans, the SME generates a message to that effect. The user can select from the list a plan to delete (n.b.: only alternative plans previously created and stored by the user can be deleted; baseline plans cannot be deleted). When the user selects a plan, the SME generates a pop-up window containing the information for the plan the user has selected for deletion. At this point, the user can confirm the deletion by pressing <Enter> or "y", or abort the delete process by pressing <Esc> or "n". Additionally, if the plan the user has selected to delete is the currently loaded plan and the user confirms the deletion, the SME will automatically reload the current baseline plan.

7.2.6 CONTEXT

The context option displays a pop-up window containing a summary of the current planning information. General information such as the project name and type, current plan name and date, and whether the plan has been modified are displayed. The context option also displays the baseline and currently loaded plans' completion estimates and schedules.

Pressing the <Enter> or <Esc> key returns the user to the planning function menu.

7.2.7 QUIT

The quit option removes the planning function menu and returns the user to the executive menu.



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SECTION 8 - OVERALL ASSESSMENT FUNCTIONS

Overall assessment provides features for calculating, displaying, and analyzing high-level project attributes (e.g., correctability and maintainability). Analysis of these attributes can help managers reach conclusions about the overall quality of a project's process and product based on objective data.

8.1 GENERAL INFORMATION

When the overall assessment function is selected from the SME executive menu, a pop-up window appears containing a selection list (Section 3.2) of lifecycle phases for the project of interest. The user has the option of performing an assessment for a particular software development phase, or performing an assessment for all phases of the development lifecycle. Once the selection is made, the SME generates a vertical bar graph depicting relative quality indices for the defined attributes. Figure 8-1 shows a sample graph.

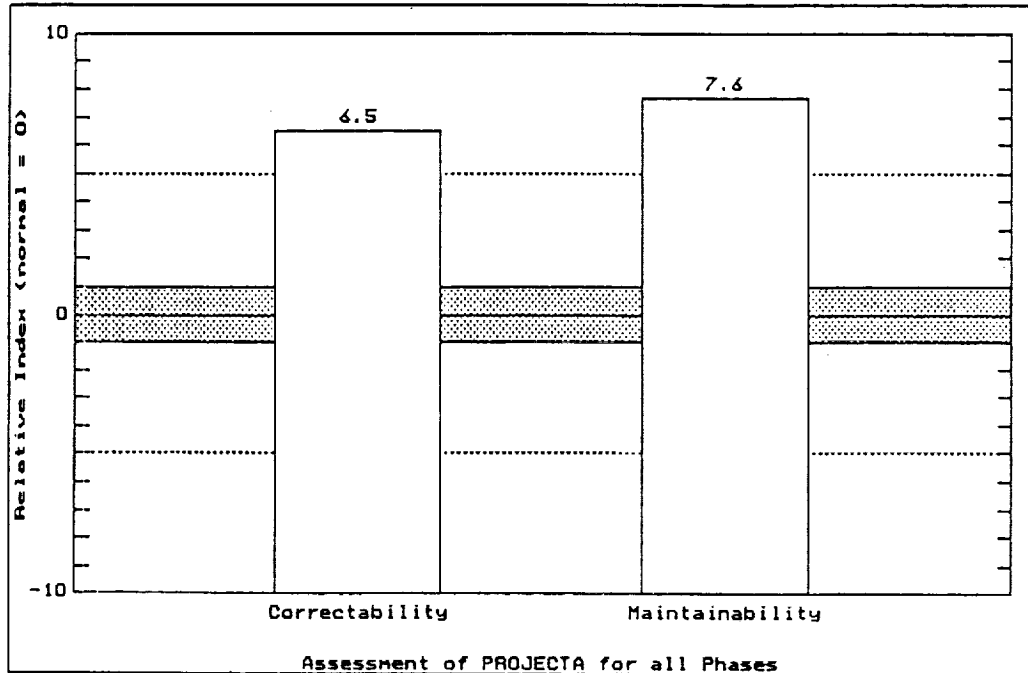


Figure 8-1. Sample Overall Assessment Graph

The overall assessment graph has the following features:

- The project name and phase name for which the assessment is being performed appear in the graph title.
- The graph is scaled vertically from -10 to +10 with 0 being a normal relative index.
- The blue-shaded horizontal bar represents plus or minus 10 percent of normal.
- A vertical bar is displayed for each attribute assessed. If the relative index is greater than or equal to zero, the bar is displayed in green. If the relative index is less than zero but

greater than or equal to -5, the bar is displayed in yellow. If the relative index is less than -5, the bar is displayed in red.

- The numeric relative index value for each attribute is displayed above the corresponding vertical bar.

After pressing any key, the overall assessment menu appears at the top of the screen. The overall assessment menu contains five options for selection: view, examine, re-assess, context, and quit. Initially, the view option is highlighted as a default. Figure 8-2 presents the overall assessment menu.



Figure 8-2. Overall Assessment Menu

8.2 OVERALL ASSESSMENT MENU OPTIONS

The following sections describe the view, examine, re-assess, context, and quit options.

8.2.1 VIEW

The view option temporarily removes the overall assessment menu from the screen to uncover the entire plotting area.

Once the plot is uncovered, pressing any key restores the menu.

8.2.2 EXAMINE

The examine option of the overall assessment menu causes the examine function to be executed. This is discussed in detail in Section 8.3.

8.2.3 RE-ASSESS

The re-assess option of the overall assessment menu allows the user to change, via a selection list, the project lifecycle phase being analyzed. Once a new phase has been selected, the current graph is erased and replaced with a new graph displaying information relevant to the phase selected.

8.2.4 CONTEXT

The context option displays a pop-up window containing a summary of the current context information. The project name, plan type, and last date for which there is available data are displayed. If a particular lifecycle phase is being analyzed, the phase start and end dates and phase name are displayed. If the entire project lifecycle is being analyzed, the project start and end dates are displayed. Additionally, the measure name, actual, expected, and estimated data values for all measures used when computing the relative index are displayed. Pressing the <Enter> or <Esc> key returns the user to the overall assessment menu.

8.2.5 QUIT

The quit option removes the overall assessment menu and returns the user to the executive menu.

8.3 OVERALL ASSESSMENT EXAMINE FUNCTION

The examine function enables the user to investigate further the strengths and weaknesses of a project by displaying the underlying factors associated with a given attribute. The following sections detail the use of the examine function.

8.3.1 GENERAL INFORMATION

When the examine function is selected from the overall assessment menu, a pop-up window appears containing a selection list of attributes available for further analysis. Any attribute on the list may be selected. Section 3.2 presents detailed information on choosing items from a selection list.

When an attribute is selected for further examination, the graph generated is the same as that generated by the overall assessment function, except the attribute selected is differentiated into the component factors on which the overall assessment is based.

After the <Enter> or <Esc> key is pressed, the examine menu appears at the top of the screen. The menu contains five options for selection: view, attribute, show, context, and quit. Initially, the view option is highlighted as a default. Figure 8-3 presents the examine menu.

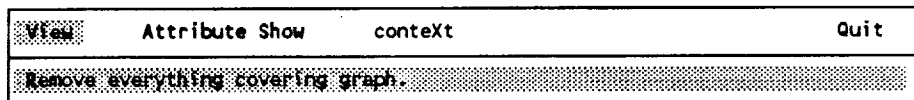


Figure 8-3. Examine Menu

8.3.2 VIEW

The view option temporarily removes the examine menu from the screen to uncover the entire plotting area. Once the plot is uncovered, pressing any key restores the menu.

8.3.3 ATTRIBUTE

The attribute option of the examine menu allows the user to change the attribute being examined. Once an attribute has been selected from a selection list, the current graph is erased and replaced with a new graph of the selected attribute.

8.3.4 SHOW

The show option of the examine menu generates a horizontal bar graph displaying the factors that were analyzed in arriving at the relative index of the particular attribute. Figure 8-4 presents a sample graph.

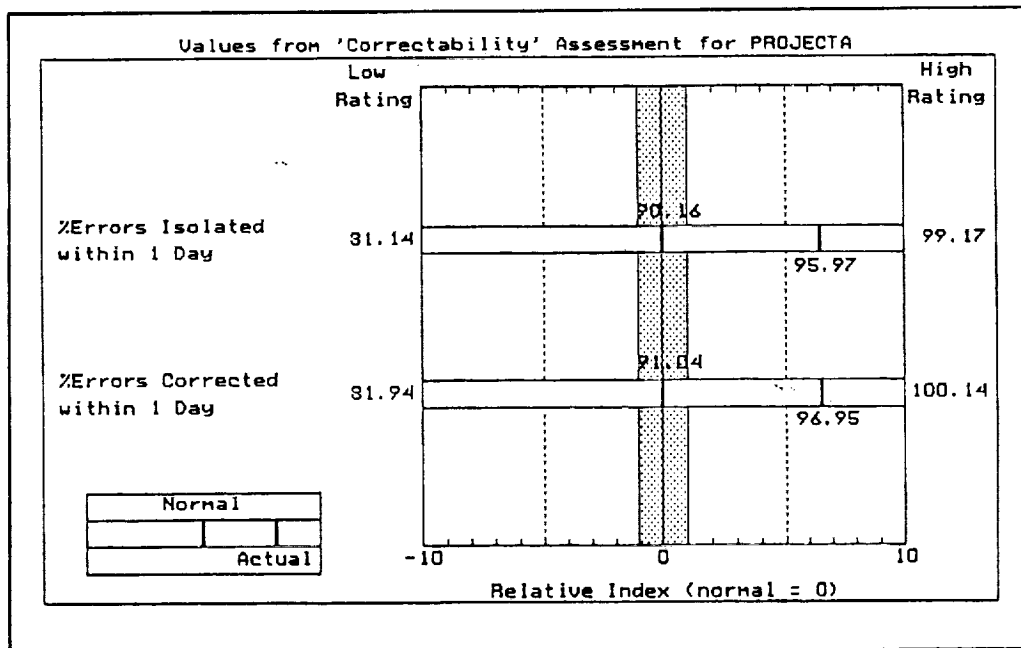


Figure 8-4. Sample Factor Graph

The factor graph has the following features:

- The project name and attribute being examined appear in the graph title. The factors being evaluated appear along the left Y-axis.
- The graph is scaled horizontally from a low rating of -10 to a high rating of +10, with 0 being a normal relative index.
- The light-blue horizontal bars represent a range of plus or minus 10 percent of the expected value for each factor. The numeric low and high range values appear to the left and right of the horizontal bars, respectively.

- The expected (normal) values are represented by a vertical red line on each horizontal bar, labeled in red with the numeric expected value.
- The blue-shaded vertical bar represents plus or minus 10 percent of the high and low ranges, respectively.
- The actual data value for each factor is represented by a green vertical line on the horizontal bars, labeled in green with the numeric actual value.

Pressing the <Enter> or <Esc> key restores the examine menu.

8.3.5 CONTEXT

The context option displays a pop-up window containing a summary of the current context information. The project name, plan type, and last date for which there is available data are displayed. If a particular lifecycle phase is being examined, the phase start and end dates and phase name are displayed. If the entire project lifecycle is being examined, the project start and end dates are displayed. Additionally, the measure name and the actual, expected, and estimated data values for the measure used when computing the relative index are displayed. Pressing the <Enter> or <Esc> key returns the user to the examine menu.

8.3.6 QUIT

The quit option removes the examine menu and returns the user to the overall assessment menu.



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SECTION 9 - OPTIONS

The options function provides features that enable the user to establish display parameters the SME will use when plotting data. The following sections describe these parameters.

9.1 GENERAL INFORMATION

When the user selects "options" from the SME executive menu, a list containing four items appears in a pop-up window. From this list the user can select the display parameter(s) to be modified. The user governs whether the SME guidelines and/or manager's plan is displayed on the growth and rate monitor plots. The user can also set a project date. This date determines what baseline plan the SME uses when plotting, and causes measure data to be truncated to include only data points recorded up to the project date. The following sections describe these options in detail.

9.2 GUIDELINES

The first item in the options list, "Turn guidelines on/off", toggles an internal switch that governs whether guidelines are displayed on plots. When this option is selected, pressing <Enter> toggles the internal switch. If on, an area of the graph is shaded to indicate the nominal value and expected range (nominal value plus or minus 10 percent) of the current performance measure for a typical model project.

9.3 MANAGER'S PLAN

The second item in the options list, "Turn manager's plan on/off", toggles an internal switch that governs whether the manager's planned growth for the current measure is displayed. This option functions the same as the guidelines option described above in that when selected, pressing <Enter> toggles the internal switch. If on, the manager's planned growth appears on the plot as a dashed yellow line.

9.4 PROJECT DATE

The third item in the options list, "Set project date", allows the user to "travel back in time." When this option is selected, a pop-up window appears requesting that the user enter a date. Any date between the project start and end dates is permissible. When the user enters a new project date, the SME loads whatever baseline plan (schedule and completion estimates) was in effect on that date. Additionally, the data is displayed on plots as it existed on that date. Thus the user is able to display what the SME would have plotted, for example, at the end of code and test phase. The fourth item in the options list, "Reset project date", simply resets the system date back to the current date, thus undoing any previous project date entered by the user.

GLOSSARY

AGSS	attitude ground support system
COF	Component Origination Form
CRF	Change Report Form
EGA	enhanced graphics adapter
FDD	Flight Dynamics Division
GSFC	Goddard Space Flight Center
PC	personal computer
PEF	Project Estimates Form
PRF	Personnel Resources Form
SEL	Software Engineering Laboratory
SME	Software Management Environment
SPF	Services/Products Form
STL	Systems Technology Laboratory

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REFERENCES

1. Software Engineering Laboratory, SEL-92-001, Software Management Environment (SME) Installation Guide, D. Kistler and K. Jeletic, January 1992

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